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Efficient simulation of multistage plasma accelerators

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Plasma accelerators can sustain accelerating gradients of up to ~100 GeV/m.
However, reaching the high energies required for future particle colliders requires the acceleration to be performed in multiple plasma stages.
Solving the challenges posed by multistage acceleration, such a beam quality preservation, requires the capability of simulating large chains of accelerating stages, something that is typically limited by the high cost of full 3D particle-in-cell codes.
Thus, there is a growing need for the development of more efficient models that allow for inexpensive collider studies with reduced physics or dimensionality.
Here, we present the implementation of a novel gridless quasistatic algorithm in the Wake-T code that, coupled with a laser envelope solver, allows for accurate and efficient simulations of multistage laser-plasma accelerators with axial symmetry, a critical step toward their realization.

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Footnotes

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Primary author: FERRAN POUSA, Ángel (Deutsches Elektronen-Synchrotron)

Co-authors: SINN, Alexander (Deutsches Elektronen-Synchrotron); THÉVENET, Maxence (Deutsches Elektronen-Synchrotron); GARTEN, Marco (Lawrence Berkeley National Laboratory); Dr HUEBL, Axel (LBNL); LEHE, Remi (Lawrence Berkeley National Laboratory); SANDBERG, Ryan (Lawrence Berkeley National Laboratory); Dr VAY, Jean-Luc (Lawrence Berkeley National Laboratory); DEN HERTOG, Willem Mijndert (Universidade de Santiago de Compostela); ORDÓÑEZ CARRASCO, Jorge Luis (Universidad Carlos III de Madrid)

Presenter: FERRAN POUSA, Ángel (Deutsches Elektronen-Synchrotron)

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